Task-2 : Stock Market Prediction And Forecasting Using Stacked LSTM

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In [1]:
```python
import math
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import pandas_datareader as pdr
import tensorflow as tf
```

In [2]:
```python
url='https://raw.githubusercontent.com/mwitiderrick/stockprice/master/NSE-TATAGLOBAL.csv'
data=pd.read_csv(url)
```

In [3]:
```python
data.head()
```

Out[3]:

	Date	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)
0	2018-09-28	234.05	235.95	230.20	233.50	233.75	3069914	7162.35
1	2018-09-27	234.55	236.80	231.10	233.80	233.25	5082859	11859.95
2	2018-09-26	240.00	240.00	232.50	235.00	234.25	2240909	5248.60
3	2018-09-25	233.30	236.75	232.00	236.25	236.10	2349368	5503.90
4	2018-09-24	233.55	239.20	230.75	234.00	233.30	3423509	7999.55

In [4]:
```python
data.shape
```

Out[4]:
```
(2035, 8)
```

```
In [5]:  data.tail()
```

Out[5]:

	Date	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)
2030	2010-07-27	117.6	119.50	112.00	118.80	118.65	586100	694.98
2031	2010-07-26	120.1	121.00	117.10	117.10	117.60	658440	780.01
2032	2010-07-23	121.8	121.95	120.25	120.35	120.65	281312	340.31
2033	2010-07-22	120.3	122.00	120.25	120.75	120.90	293312	355.17
2034	2010-07-21	122.1	123.00	121.05	121.10	121.55	658666	803.56

```
In [6]:  df=data.sort_values(by="Date")
         df.head()
```

Out[6]:

	Date	Open	High	Low	Last	Close	Total Trade Quantity	Turnover (Lacs)
2034	2010-07-21	122.1	123.00	121.05	121.10	121.55	658666	803.56
2033	2010-07-22	120.3	122.00	120.25	120.75	120.90	293312	355.17
2032	2010-07-23	121.8	121.95	120.25	120.35	120.65	281312	340.31
2031	2010-07-26	120.1	121.00	117.10	117.10	117.60	658440	780.01
2030	2010-07-27	117.6	119.50	112.00	118.80	118.65	586100	694.98

```
In [7]:  df=df.reset_index().Close
         df
```

Out[7]:
```
0        121.55
1        120.90
2        120.65
3        117.60
4        118.65
          ...
2030     233.30
2031     236.10
```
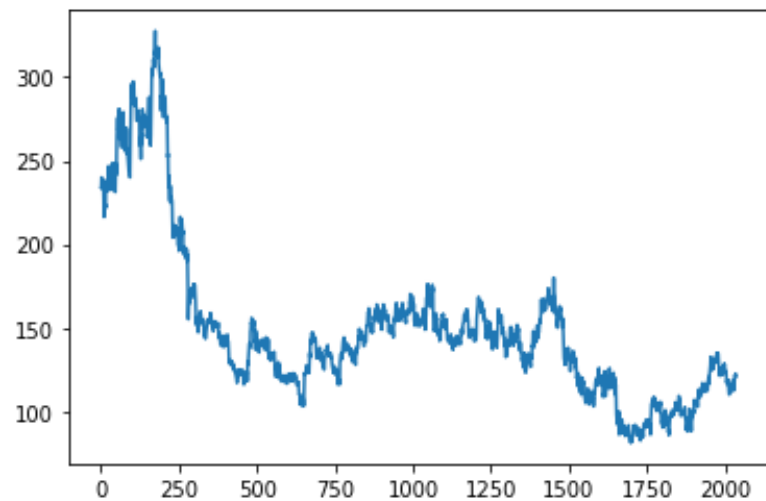
```
2032    234.25
2033    233.25
2034    233.75
Name: Close, Length: 2035, dtype: float64
```

In [8]:
```python
dff=data.Open
dff
```

Out[8]:
```
0          234.05
1          234.55
2          240.00
3          233.30
4          233.55
            ...
2030       117.60
2031       120.10
2032       121.80
2033       120.30
2034       122.10
Name: Open, Length: 2035, dtype: float64
```
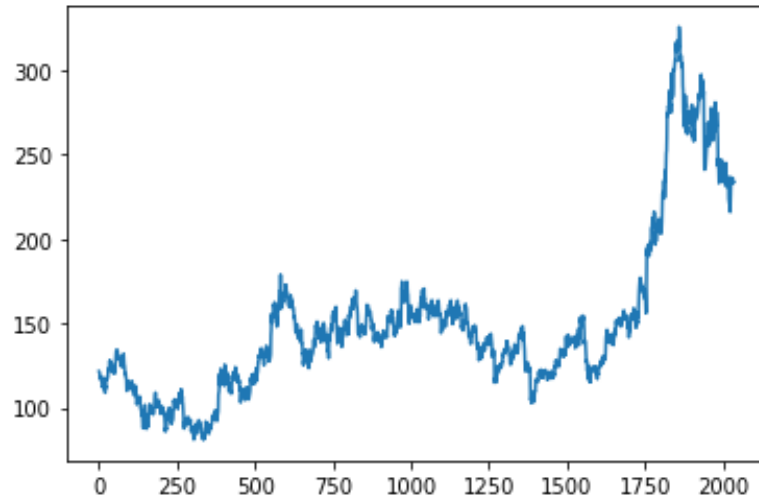
In [9]:
```python
dff.plot()
```

Out[9]:
```
<AxesSubplot:>
```

```
In [10]:   df.plot()
```

Out[10]:   <AxesSubplot:>


```
In [11]:   #Transform features by scaling each feature to a given range
           from sklearn.preprocessing import MinMaxScaler

           sc = MinMaxScaler(feature_range = (0, 1))
           df = sc.fit_transform(np.array(df).reshape(-1,1))
```

```
In [27]:   df
```

Out[27]:   array([[0.16584967],
                  [0.16319444],
                  [0.1621732],
                  ...,
                  [0.62622549],
                  [0.62214052],
                  [0.62418301]])

starting with train,test set for training and testing

```
In [12]:  train_size = int(len(df) * 0.70)

          test_size = len(df) - train_size

          trainSet, testSet = df[0:train_size, :], df[train_size:len(df), :1]
```

Data set Generation

```
In [13]:  def datasetGen(data, length):
              arA, arB = [], []
              for i in range(len(data)-length-1):
                  arA.append(data[i:(i + length), 0])
                  arB.append(data[i + length, 0])
              return np.array(arr1), np.array(arr2)
```

```
In [14]:  X_train, Y_train = datasetGen(trainSet, 100)
          X_test, Y_test = datasetGen(testSet, 100)
```

```
In [28]:  print(X_train.shape)
          print()
          X_train
```

```
(1323, 100, 1)
```

```
Out[28]:  array([[[0.16584967],
                  [0.16319444],
                  [0.1621732 ],
                  ...,
                  [0.14011438],
                  [0.13848039],
                  [0.12479575]],

                 [[0.16319444],
                  [0.1621732 ],
                  [0.14971405],
                  ...,
                  [0.13848039],
```

```
          [0.12479575],
          [0.12254902]],

         [[0.1621732 ],
          [0.14971405],
          [0.15400327],
          ...,
          [0.12479575],
          [0.12254902],
          [0.13010621]],

         ...,

         [[0.18280229],
          [0.19178922],
          [0.19219771],
          ...,
          [0.16441993],
          [0.15236928],
          [0.15482026]],

         [[0.19178922],
          [0.19219771],
          [0.19281046],
          ...,
          [0.15236928],
          [0.15482026],
          [0.15420752]],

         [[0.19219771],
          [0.19281046],
          [0.21058007],
          ...,
          [0.15482026],
          [0.15420752],
          [0.15012255]]])
```

In [31]:
```python
print(Y_train.shape)
print()
Y_train
```

```
(1323,)
```

array([0.12254902, 0.13010621, 0.13541667, ..., 0.15420752, 0.15012255,
       0.15747549])

```
print(X_test.shape)
print()
X_test
```

```
(510, 100, 1)
```

array([[[0.1621732],
        [0.15951797],
        [0.16707516],
        ...,
        [0.24775327],
        [0.24836601],
        [0.25020425]],

       [[0.15951797],
        [0.16707516],
        [0.15992647],
        ...,
        [0.24836601],
        [0.25020425],
        [0.25020425]],

       [[0.16707516],
        [0.15992647],
        [0.16053922],
        ...,
        [0.25020425],
        [0.25020425],
        [0.23999183]],

       ...,

       [[0.86519608],
        [0.84027778],
        [0.84497549],
        ...,
```

```
           [0.62888072],
           [0.62765523],
           [0.62234477]],

          [[0.84027778],
           [0.84497549],
           [0.87111928],
           ...,
           [0.62765523],
           [0.62234477],
           [0.63378268]],

          [[0.84497549],
           [0.87111928],
           [0.85273693],
           ...,
           [0.62234477],
           [0.63378268],
           [0.62622549]]])
```

In [33]:
```python
print(Y_test.shape)
print()
Y_test
```

```
(510,)
```

Out[33]:
```
array([0.25020425, 0.23999183, 0.22201797, 0.23080065, 0.22896242,
       0.24060458, 0.24080882, 0.23304739, 0.23325163, 0.23672386,
       0.25102124, 0.24387255, 0.25980392, 0.26879085, 0.22896242,
       0.23958333, 0.25081699, 0.24857026, 0.29554739, 0.28574346,
       0.2871732 , 0.28880719, 0.27328431, 0.29513889, 0.28308824,
       0.28982843, 0.30085784, 0.29166667, 0.29227941, 0.29861111,
       0.28206699, 0.26327614, 0.23202614, 0.24101307, 0.23876634,
       0.23549837, 0.22058824, 0.20588235, 0.1875    , 0.19219771,
       0.18995098, 0.16727941, 0.1815768 , 0.15400327, 0.14726307,
       0.16482843, 0.15379902, 0.15992647, 0.14174837, 0.14848856,
       0.1499183 , 0.13950163, 0.15339052, 0.16339869, 0.16748366,
       0.1752451 , 0.16727941, 0.16584967, 0.1744281 , 0.17340686,
       0.1689134 , 0.1752451 , 0.17544935, 0.17320261, 0.17320261,
       0.17075163, 0.17769608, 0.17708333, 0.17708333, 0.16462418,
       0.16605392, 0.15706699, 0.15482026, 0.14726307, 0.16176471,
```

0.15788399, 0.16401144, 0.16768791, 0.17401961, 0.17769608,
0.17769608, 0.1807598 , 0.17851307, 0.17892157, 0.17769608,
0.19035948, 0.18055556, 0.19362745, 0.19076797, 0.19056373,
0.19485294, 0.20241013, 0.18566176, 0.19178922, 0.19403595,
0.19362745, 0.19709967, 0.20220588, 0.19566993, 0.20077614,
0.23161765, 0.24877451, 0.25245098, 0.24795752, 0.26633987,
0.25714869, 0.25735294, 0.24918301, 0.24611928, 0.23611111,
0.24162582, 0.24183007, 0.24775327, 0.24775327, 0.24121732,
0.23815359, 0.23672386, 0.23325163, 0.2559232 , 0.24571078,
0.25490196, 0.25449346, 0.25245098, 0.24693627, 0.24448529,
0.22937092, 0.23917484, 0.24489379, 0.26041667, 0.26082516,
0.26756536, 0.26531863, 0.25388072, 0.28860294, 0.28676471,
0.27634804, 0.28431373, 0.28451797, 0.28267974, 0.28431373,
0.28982843, 0.29289216, 0.29452614, 0.28451797, 0.28594771,
0.29595588, 0.28921569, 0.28410948, 0.27982026, 0.2745098 ,
0.28288399, 0.29084967, 0.28737745, 0.29003268, 0.28901144,
0.29738562, 0.29064542, 0.29473039, 0.31352124, 0.30739379,
0.30392157, 0.29146242, 0.29268791, 0.29861111, 0.30187908,
0.29840686, 0.29289216, 0.30085784, 0.3002451 , 0.29370915,
0.27185458, 0.28002451, 0.27308007, 0.26062092, 0.24816176,
0.25367647, 0.26940359, 0.26327614, 0.26388889, 0.27961601,
0.29187092, 0.30187908, 0.30228758, 0.2943219 , 0.30473856,
0.30085784, 0.30004085, 0.29064542, 0.30841503, 0.31658497,
0.3192402 , 0.31556373, 0.30821078, 0.31004902, 0.30984477,
0.30147059, 0.28676471, 0.27124183, 0.27859477, 0.27593954,
0.28472222, 0.28860294, 0.28227124, 0.30718954, 0.29575163,
0.31372549, 0.3496732 , 0.36172386, 0.37908497, 0.38582516,
0.3809232 , 0.39236111, 0.37908497, 0.38480392, 0.3690768 ,
0.37275327, 0.36376634, 0.36846405, 0.37275327, 0.35723039,
0.36029412, 0.3619281 , 0.35355392, 0.34375   , 0.3500817 ,
0.34926471, 0.36560458, 0.34742647, 0.3314951 , 0.3065768 ,
0.34007353, 0.3995098 , 0.46119281, 0.44791667, 0.46343954,
0.47058824, 0.44485294, 0.47222222, 0.4628268 , 0.45894608,
0.44689542, 0.47426471, 0.47814542, 0.47651144, 0.45894608,
0.47283497, 0.51062092, 0.50980392, 0.51450163, 0.52410131,
0.53553922, 0.51613562, 0.53553922, 0.52941176, 0.54064542,
0.55249183, 0.54227941, 0.53615196, 0.49101307, 0.47263072,
0.50531046, 0.48059641, 0.49918301, 0.51000817, 0.5126634 ,
0.50653595, 0.5249183 , 0.52553105, 0.52022059, 0.52083333,
0.52471405, 0.53533497, 0.52818627, 0.52553105, 0.52839052,
0.51409314, 0.50510621, 0.49897876, 0.52573529, 0.50796569,
0.52634804, 0.57005719, 0.59579248, 0.59640523, 0.59987745,

```
0.59395425, 0.58966503, 0.62806373, 0.58843954, 0.58639706,
0.65155229, 0.63398693, 0.62683824, 0.67708333, 0.6942402 ,
0.69852941, 0.7310049 , 0.79227941, 0.78513072, 0.78880719,
0.79187092, 0.80780229, 0.80269608, 0.84477124, 0.81392974,
0.84211601, 0.82761438, 0.80923203, 0.8129085 , 0.79248366,
0.82945261, 0.84763072, 0.8880719 , 0.84497549, 0.83129085,
0.8306781 , 0.84109477, 0.85743464, 0.89746732, 0.89828431,
0.89542484, 0.90604575, 0.91911765, 0.91748366, 0.92177288,
0.96180556, 0.94750817, 0.94035948, 0.94056373, 0.94485294,
0.94771242, 0.96670752, 0.95731209, 0.95241013, 0.94914216,
1.        , 0.98876634, 0.96180556, 0.9501634 , 0.91707516,
0.92892157, 0.93096405, 0.92422386, 0.9121732 , 0.9121732 ,
0.90216503, 0.91115196, 0.85661765, 0.84722222, 0.79207516,
0.78492647, 0.75878268, 0.81372549, 0.81495098, 0.80596405,
0.83394608, 0.82107843, 0.80923203, 0.79513889, 0.76388889,
0.74305556, 0.75837418, 0.74019608, 0.77512255, 0.78656046,
0.79268791, 0.79473039, 0.79207516, 0.79534314, 0.78921569,
0.76776961, 0.78615196, 0.76552288, 0.79697712, 0.8057598 ,
0.80698529, 0.81147876, 0.78206699, 0.73386438, 0.73978758,
0.74448529, 0.72671569, 0.72283497, 0.74040033, 0.74693627,
0.72630719, 0.80065359, 0.79187092, 0.77328431, 0.78451797,
0.78329248, 0.80412582, 0.79473039, 0.7879902 , 0.7879902 ,
0.79473039, 0.81168301, 0.81699346, 0.82986111, 0.83843954,
0.83884804, 0.82781863, 0.82598039, 0.85028595, 0.85886438,
0.86254085, 0.88480392, 0.86519608, 0.84027778, 0.84497549,
0.87111928, 0.85273693, 0.86213235, 0.83455882, 0.84375   ,
0.71466503, 0.66053922, 0.65420752, 0.68035131, 0.6689134 ,
0.66421569, 0.67892157, 0.69138072, 0.70894608, 0.72263072,
0.73406863, 0.72120098, 0.74979575, 0.7689951 , 0.74468954,
0.7120098 , 0.74673203, 0.75490196, 0.76041667, 0.75980392,
0.74652778, 0.76245915, 0.77062908, 0.80412582, 0.78104575,
0.79411765, 0.76021242, 0.73488562, 0.72406046, 0.73999183,
0.74979575, 0.76143791, 0.75428922, 0.74754902, 0.76960784,
0.7495915 , 0.81719771, 0.80208333, 0.77736928, 0.75714869,
0.79370915, 0.79166667, 0.77144608, 0.75265523, 0.72691993,
0.6629902 , 0.68198529, 0.64419935, 0.62152778, 0.6439951 ,
0.66319444, 0.67544935, 0.63705065, 0.64603758, 0.65890523,
0.65870098, 0.67790033, 0.63194444, 0.63112745, 0.62785948,
0.64767157, 0.63991013, 0.63480392, 0.63868464, 0.62336601,
0.62745098, 0.63970588, 0.64705882, 0.66196895, 0.67075163,
0.65196078, 0.63112745, 0.61294935, 0.6376634 , 0.62254902,
0.62745098, 0.63337418, 0.62642974, 0.63623366, 0.58312908,
```

```
       0.57781863, 0.57230392, 0.58006536, 0.57618464, 0.55167484,
       0.57883987, 0.625     , 0.63582516, 0.62949346, 0.62888072,
       0.62765523, 0.62234477, 0.63378268, 0.62622549, 0.62214052])
```

reording Column Inputs

In [34]:
```python
X_train = X_train.reshape(X_train.shape[0], X_train.shape[1], 1)
X_test = X_test.reshape(X_test.shape[0], X_test.shape[1], 1)
```

Starting with Stacked LSTM model

In [35]:
```python
from keras.models import Sequential
from keras.layers import Dense, LSTM
```

In [40]:
```python
model = Sequential()

## Stacked LSTM model with 50 hidden layers.
model.add(LSTM(50, return_sequences= True, input_shape= (100,1)))
model.add(LSTM(50, return_sequences= True))
model.add(LSTM(50, return_sequences= True))
model.add(LSTM(50))

## Output Layer
model.add(Dense(1))

## Compile the model
model.compile(loss= 'mean_squared_error', optimizer= 'adam')
```

In [41]:
```python
model.summary()
```

```
Model: "sequential_2"
_____
 Layer (type)                Output Shape              Param #
=================================================================
 lstm_8 (LSTM)               (None, 100, 50)           10400
```

```
lstm_9 (LSTM)               (None, 100, 50)           20200

lstm_10 (LSTM)              (None, 100, 50)           20200

lstm_11 (LSTM)              (None, 50)                20200

dense_2 (Dense)             (None, 1)                 51

=================================================================
Total params: 71,051
Trainable params: 71,051
Non-trainable params: 0
_____
```

In [42]:
```python
## Training Procedure
model.fit(X_train, Y_train, validation_data= (X_test, Y_test), epochs= 100, batch_size= 64, verbose= 1)
```

```
Epoch 1/100
21/21 [==============================] - 26s 628ms/step - loss: 0.0083 - val_loss: 0.0241
Epoch 2/100
21/21 [==============================] - 9s 447ms/step - loss: 0.0016 - val_loss: 0.0058
Epoch 3/100
21/21 [==============================] - 9s 446ms/step - loss: 0.0012 - val_loss: 0.0076
Epoch 4/100
21/21 [==============================] - 9s 448ms/step - loss: 0.0011 - val_loss: 0.0045
Epoch 5/100
21/21 [==============================] - 9s 445ms/step - loss: 0.0011 - val_loss: 0.0051
Epoch 6/100
21/21 [==============================] - 9s 450ms/step - loss: 0.0010 - val_loss: 0.0067
Epoch 7/100
21/21 [==============================] - 9s 446ms/step - loss: 9.6973e-04 - val_loss: 0.0055
Epoch 8/100
21/21 [==============================] - 9s 446ms/step - loss: 9.6582e-04 - val_loss: 0.0063
Epoch 9/100
21/21 [==============================] - 9s 447ms/step - loss: 9.0100e-04 - val_loss: 0.0078
Epoch 10/100
21/21 [==============================] - 9s 447ms/step - loss: 8.7918e-04 - val_loss: 0.0081
Epoch 11/100
21/21 [==============================] - 9s 446ms/step - loss: 8.3878e-04 - val_loss: 0.0046
Epoch 12/100
```

```
21/21 [==============================] - 9s 446ms/step - loss: 8.0756e-04 - val_loss: 0.0045
Epoch 13/100
21/21 [==============================] - 9s 446ms/step - loss: 7.6312e-04 - val_loss: 0.0070
Epoch 14/100
21/21 [==============================] - 9s 444ms/step - loss: 7.7651e-04 - val_loss: 0.0106
Epoch 15/100
21/21 [==============================] - 9s 447ms/step - loss: 7.3030e-04 - val_loss: 0.0120
Epoch 16/100
21/21 [==============================] - 9s 445ms/step - loss: 7.2185e-04 - val_loss: 0.0117
Epoch 17/100
21/21 [==============================] - 9s 446ms/step - loss: 7.0774e-04 - val_loss: 0.0109
Epoch 18/100
21/21 [==============================] - 9s 444ms/step - loss: 6.6743e-04 - val_loss: 0.0069
Epoch 19/100
21/21 [==============================] - 9s 446ms/step - loss: 6.7868e-04 - val_loss: 0.0078
Epoch 20/100
21/21 [==============================] - 9s 445ms/step - loss: 6.8190e-04 - val_loss: 0.0063
Epoch 21/100
21/21 [==============================] - 9s 448ms/step - loss: 6.4858e-04 - val_loss: 0.0091
Epoch 22/100
21/21 [==============================] - 10s 463ms/step - loss: 6.1573e-04 - val_loss: 0.0102
Epoch 23/100
21/21 [==============================] - 9s 446ms/step - loss: 7.2068e-04 - val_loss: 0.0048
Epoch 24/100
21/21 [==============================] - 9s 430ms/step - loss: 6.1793e-04 - val_loss: 0.0050
Epoch 25/100
21/21 [==============================] - 9s 447ms/step - loss: 6.0539e-04 - val_loss: 0.0055
Epoch 26/100
21/21 [==============================] - 9s 445ms/step - loss: 5.3843e-04 - val_loss: 0.0066
Epoch 27/100
21/21 [==============================] - 9s 442ms/step - loss: 5.3525e-04 - val_loss: 0.0067
Epoch 28/100
21/21 [==============================] - 9s 444ms/step - loss: 5.1546e-04 - val_loss: 0.0051
Epoch 29/100
21/21 [==============================] - 9s 447ms/step - loss: 5.1158e-04 - val_loss: 0.0056
Epoch 30/100
21/21 [==============================] - 9s 444ms/step - loss: 4.8144e-04 - val_loss: 0.0045
Epoch 31/100
21/21 [==============================] - 9s 443ms/step - loss: 4.5406e-04 - val_loss: 0.0086
Epoch 32/100
21/21 [==============================] - 9s 437ms/step - loss: 4.9131e-04 - val_loss: 0.0039
Epoch 33/100
```

```
21/21 [==============================] - 9s 444ms/step - loss: 4.3976e-04 - val_loss: 0.0021
Epoch 34/100
21/21 [==============================] - 9s 441ms/step - loss: 4.1750e-04 - val_loss: 0.0051
Epoch 35/100
21/21 [==============================] - 9s 443ms/step - loss: 3.7826e-04 - val_loss: 0.0031
Epoch 36/100
21/21 [==============================] - 9s 446ms/step - loss: 4.0094e-04 - val_loss: 0.0043
Epoch 37/100
21/21 [==============================] - 9s 441ms/step - loss: 3.8499e-04 - val_loss: 0.0030
Epoch 38/100
21/21 [==============================] - 9s 441ms/step - loss: 3.2767e-04 - val_loss: 0.0044
Epoch 39/100
21/21 [==============================] - 9s 447ms/step - loss: 3.1347e-04 - val_loss: 0.0020
Epoch 40/100
21/21 [==============================] - 9s 445ms/step - loss: 3.1695e-04 - val_loss: 0.0017
Epoch 41/100
21/21 [==============================] - 9s 447ms/step - loss: 3.0407e-04 - val_loss: 0.0021
Epoch 42/100
21/21 [==============================] - 9s 447ms/step - loss: 3.1325e-04 - val_loss: 0.0024
Epoch 43/100
21/21 [==============================] - 9s 439ms/step - loss: 3.8333e-04 - val_loss: 0.0023
Epoch 44/100
21/21 [==============================] - 9s 442ms/step - loss: 3.3562e-04 - val_loss: 0.0037
Epoch 45/100
21/21 [==============================] - 9s 443ms/step - loss: 2.5687e-04 - val_loss: 0.0023
Epoch 46/100
21/21 [==============================] - 9s 447ms/step - loss: 2.5158e-04 - val_loss: 0.0033
Epoch 47/100
21/21 [==============================] - 9s 453ms/step - loss: 2.4951e-04 - val_loss: 0.0014
Epoch 48/100
21/21 [==============================] - 9s 446ms/step - loss: 2.9410e-04 - val_loss: 0.0042
Epoch 49/100
21/21 [==============================] - 9s 450ms/step - loss: 2.4326e-04 - val_loss: 0.0018
Epoch 50/100
21/21 [==============================] - 9s 446ms/step - loss: 2.1838e-04 - val_loss: 0.0023
Epoch 51/100
21/21 [==============================] - 9s 446ms/step - loss: 2.0341e-04 - val_loss: 0.0031
Epoch 52/100
21/21 [==============================] - 9s 434ms/step - loss: 2.0791e-04 - val_loss: 0.0011
Epoch 53/100
21/21 [==============================] - 9s 446ms/step - loss: 1.8995e-04 - val_loss: 0.0020
Epoch 54/100
```

```
21/21 [==============================] - 9s 444ms/step - loss: 1.8928e-04 - val_loss: 0.0014
Epoch 55/100
21/21 [==============================] - 9s 447ms/step - loss: 2.0658e-04 - val_loss: 0.0013
Epoch 56/100
21/21 [==============================] - 8s 400ms/step - loss: 1.8186e-04 - val_loss: 0.0017
Epoch 57/100
21/21 [==============================] - 9s 440ms/step - loss: 1.7449e-04 - val_loss: 0.0019
Epoch 58/100
21/21 [==============================] - 9s 446ms/step - loss: 1.5785e-04 - val_loss: 0.0013
Epoch 59/100
21/21 [==============================] - 9s 443ms/step - loss: 1.6955e-04 - val_loss: 0.0010
Epoch 60/100
21/21 [==============================] - 9s 446ms/step - loss: 1.9400e-04 - val_loss: 0.0033
Epoch 61/100
21/21 [==============================] - 10s 467ms/step - loss: 1.8846e-04 - val_loss: 9.1300e-04
Epoch 62/100
21/21 [==============================] - 9s 448ms/step - loss: 2.0368e-04 - val_loss: 0.0012
Epoch 63/100
21/21 [==============================] - 9s 446ms/step - loss: 1.8990e-04 - val_loss: 0.0014
Epoch 64/100
21/21 [==============================] - 9s 444ms/step - loss: 1.5244e-04 - val_loss: 0.0011
Epoch 65/100
21/21 [==============================] - 9s 448ms/step - loss: 1.6491e-04 - val_loss: 0.0013
Epoch 66/100
21/21 [==============================] - 9s 443ms/step - loss: 1.6471e-04 - val_loss: 7.7323e-04
Epoch 67/100
21/21 [==============================] - 9s 444ms/step - loss: 1.8939e-04 - val_loss: 0.0013
Epoch 68/100
21/21 [==============================] - 9s 450ms/step - loss: 1.4464e-04 - val_loss: 0.0021
Epoch 69/100
21/21 [==============================] - 9s 448ms/step - loss: 1.6168e-04 - val_loss: 0.0011
Epoch 70/100
21/21 [==============================] - 9s 444ms/step - loss: 1.7206e-04 - val_loss: 8.5940e-04
Epoch 71/100
21/21 [==============================] - 9s 440ms/step - loss: 1.6415e-04 - val_loss: 0.0011
Epoch 72/100
21/21 [==============================] - 9s 447ms/step - loss: 1.3930e-04 - val_loss: 0.0022
Epoch 73/100
21/21 [==============================] - 9s 447ms/step - loss: 2.0283e-04 - val_loss: 0.0052
Epoch 74/100
21/21 [==============================] - 9s 451ms/step - loss: 1.8478e-04 - val_loss: 0.0014
Epoch 75/100
```

```
21/21 [==============================] - 9s 445ms/step - loss: 1.4276e-04 - val_loss: 0.0024
Epoch 76/100
21/21 [==============================] - 9s 452ms/step - loss: 1.5224e-04 - val_loss: 0.0026
Epoch 77/100
21/21 [==============================] - 9s 450ms/step - loss: 1.6428e-04 - val_loss: 0.0019
Epoch 78/100
21/21 [==============================] - 9s 448ms/step - loss: 1.3995e-04 - val_loss: 0.0033
Epoch 79/100
21/21 [==============================] - 9s 429ms/step - loss: 1.4810e-04 - val_loss: 0.0021
Epoch 80/100
21/21 [==============================] - 9s 440ms/step - loss: 1.3661e-04 - val_loss: 0.0019
Epoch 81/100
21/21 [==============================] - 10s 455ms/step - loss: 1.3843e-04 - val_loss: 0.0030
Epoch 82/100
21/21 [==============================] - 10s 456ms/step - loss: 1.6110e-04 - val_loss: 0.0016
Epoch 83/100
21/21 [==============================] - 9s 447ms/step - loss: 1.3818e-04 - val_loss: 0.0023
Epoch 84/100
21/21 [==============================] - 9s 443ms/step - loss: 1.3606e-04 - val_loss: 0.0013
Epoch 85/100
21/21 [==============================] - 9s 447ms/step - loss: 1.4585e-04 - val_loss: 0.0010
Epoch 86/100
21/21 [==============================] - 9s 448ms/step - loss: 1.3482e-04 - val_loss: 0.0014
Epoch 87/100
21/21 [==============================] - 9s 446ms/step - loss: 1.3320e-04 - val_loss: 0.0013
Epoch 88/100
21/21 [==============================] - 9s 431ms/step - loss: 1.3978e-04 - val_loss: 0.0020
Epoch 89/100
21/21 [==============================] - 9s 439ms/step - loss: 1.5298e-04 - val_loss: 0.0019
Epoch 90/100
21/21 [==============================] - 9s 447ms/step - loss: 1.8003e-04 - val_loss: 0.0031
Epoch 91/100
21/21 [==============================] - 9s 448ms/step - loss: 1.6370e-04 - val_loss: 0.0015
Epoch 92/100
21/21 [==============================] - 9s 447ms/step - loss: 1.4927e-04 - val_loss: 0.0027
Epoch 93/100
21/21 [==============================] - 9s 448ms/step - loss: 1.3764e-04 - val_loss: 0.0022
Epoch 94/100
21/21 [==============================] - 9s 446ms/step - loss: 1.3559e-04 - val_loss: 0.0015
Epoch 95/100
21/21 [==============================] - 9s 447ms/step - loss: 1.3769e-04 - val_loss: 0.0029
Epoch 96/100
```

```
21/21 [==============================] - 9s 447ms/step - loss: 1.6741e-04 - val_loss: 0.0032
Epoch 97/100
21/21 [==============================] - 9s 447ms/step - loss: 1.4076e-04 - val_loss: 0.0021
Epoch 98/100
21/21 [==============================] - 9s 446ms/step - loss: 1.5296e-04 - val_loss: 0.0022
Epoch 99/100
21/21 [==============================] - 9s 449ms/step - loss: 1.3798e-04 - val_loss: 0.0024
Epoch 100/100
21/21 [==============================] - 9s 447ms/step - loss: 1.3930e-04 - val_loss: 0.0020
<keras.callbacks.History at 0x2d6e8dc0c40>
```

Out[42]:

In [43]:
```
test_pred = sc.inverse_transform(model.predict(X_test))
```

calc MSR

In [44]:
```
from sklearn.metrics import mean_squared_error
math.sqrt(mean_squared_error(Y_test, test_pred))
```

Out[44]:
```
206.796146792728
```

Plotting test values

In [48]:
```
val = 100
testPredPlot = np.empty_like(df)
testPredPlot[:, :] = np.nan
testPredPlot[len(X_train) + (val*2) + 1:len(df) - 1, :] = test_pred
```

In [49]:
```
plt.figure(figsize=(18, 7))
plt.plot(sc.inverse_transform(df), label="Actual Values")
plt.plot(testPredPlot, label="Predicted Values")
plt.legend(loc="upper left")
plt.show()
```
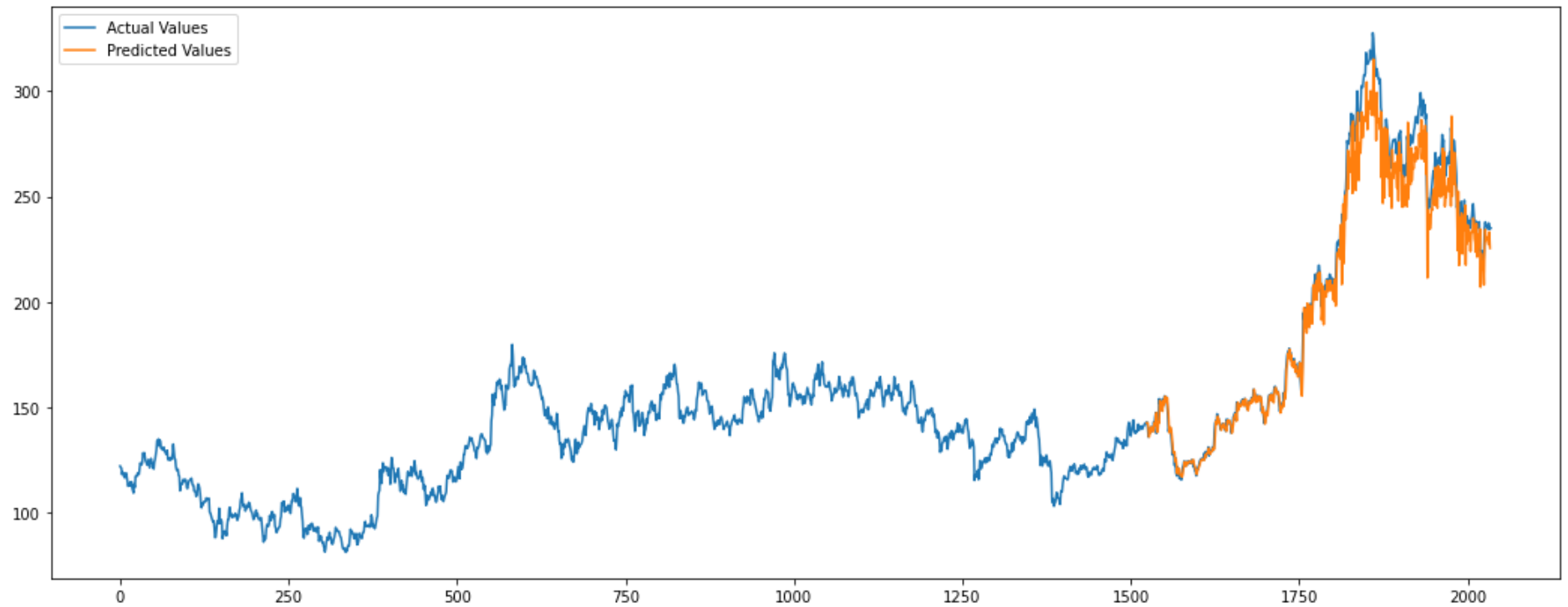
As you can see our test prediction matches original value as we can see... in graph above

In [54]:
```python
len(Y_test)
```

Out[54]: 510

In [77]:
```python
pred_input = Y_test[310:410].reshape(1,-1)
pred_input.shape
```

Out[77]: (1, 100)

In [78]:
```python
temp = list(pred_input)
temp = temp[0].tolist()
```

Defining Prediction fxn

In [79]:
```python
output = []
steps=100
i = 0
while (i < 30):
    if(len(temp) > 100):
        pred_input = np.array(temp[1:])
        print("Day {} input {}".format(i, pred_input))
        pred_input = pred_input.reshape(1,-1)
        pred_input = pred_input.reshape((1, steps, 1))
        pred = model.predict(pred_input, verbose = 0)
        print("Day {} output {}".format(i, pred))
        temp.extend(pred[0].tolist())
        temp = temp[1:]
        output.extend(pred.tolist())
        i = i + 1
    else:
        pred_input = pred_input.reshape((1, steps, 1))
        pred = model.predict(pred_input, verbose = 0)
        print(pred[0])
        temp.extend(pred[0].tolist())
        print(len(temp))
        output.extend(pred.tolist())
        i = i + 1

print(output)
```

```
[0.79536206]
101
Day 1 input [0.84763072 0.8880719  0.84497549 0.83129085 0.8306781  0.84109477
 0.85743464 0.89746732 0.89828431 0.89542484 0.90604575 0.91911765
 0.91748366 0.92177288 0.96180556 0.94750817 0.94035948 0.94056373
 0.94485294 0.94771242 0.96670752 0.95731209 0.95241013 0.94914216
 1.         0.98876634 0.96180556 0.9501634  0.91707516 0.92892157
 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196
 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549
 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889
 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046
 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961
 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876
```

```
 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497
 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431
 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902
 0.79473039 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804
 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392
 0.86519608 0.84027778 0.84497549 0.79536206]
Day 1 output [[0.6724932]]
Day 2 input [0.8880719  0.84497549 0.83129085 0.8306781  0.84109477 0.85743464
 0.89746732 0.89828431 0.89542484 0.90604575 0.91911765 0.91748366
 0.92177288 0.96180556 0.94750817 0.94035948 0.94056373 0.94485294
 0.94771242 0.96670752 0.95731209 0.95241013 0.94914216 1.
 0.98876634 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405
 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765
 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098
 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889
 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791
 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196
 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699
 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033
 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797
 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039
 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863
 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608
 0.84027778 0.84497549 0.79536206 0.67249322]
Day 2 output [[0.55198026]]
Day 3 input [0.84497549 0.83129085 0.8306781  0.84109477 0.85743464 0.89746732
 0.89828431 0.89542484 0.90604575 0.91911765 0.91748366 0.92177288
 0.96180556 0.94750817 0.94035948 0.94056373 0.94485294 0.94771242
 0.96670752 0.95731209 0.95241013 0.94914216 1.         0.98876634
 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386
 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765 0.84722222
 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405
 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556
 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039
 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288
 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438
 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627
 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248
 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301
 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863 0.82598039
 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608 0.84027778
 0.84497549 0.79536206 0.67249322 0.55198026]
```

```
Day 3 output [[0.49116346]]
Day 4 input [0.83129085 0.8306781  0.84109477 0.85743464 0.89746732 0.89828431
 0.89542484 0.90604575 0.91911765 0.91748366 0.92177288 0.96180556
 0.94750817 0.94035948 0.94056373 0.94485294 0.94771242 0.96670752
 0.95731209 0.95241013 0.94914216 1.         0.98876634 0.96180556
 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386 0.9121732
 0.9121732  0.90216503 0.91115196 0.85661765 0.84722222 0.79207516
 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608
 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418
 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516
 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712
 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438 0.73978758
 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719
 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582
 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346
 0.82986111 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595
 0.85886438 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549
 0.79536206 0.67249322 0.55198026 0.49116346]
Day 4 output [[0.46929827]]
Day 5 input [0.8306781  0.84109477 0.85743464 0.89746732 0.89828431 0.89542484
 0.90604575 0.91911765 0.91748366 0.92177288 0.96180556 0.94750817
 0.94035948 0.94056373 0.94485294 0.94771242 0.96670752 0.95731209
 0.95241013 0.94914216 1.         0.98876634 0.96180556 0.9501634
 0.91707516 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732
 0.90216503 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647
 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843
 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608
 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314
 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598
 0.80698529 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529
 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359
 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039
 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346 0.82986111
 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438
 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206
 0.67249322 0.55198026 0.49116346 0.46929827]
Day 5 output [[0.45402214]]
Day 6 input [0.84109477 0.85743464 0.89746732 0.89828431 0.89542484 0.90604575
 0.91911765 0.91748366 0.92177288 0.96180556 0.94750817 0.94035948
 0.94056373 0.94485294 0.94771242 0.96670752 0.95731209 0.95241013
 0.94914216 1.         0.98876634 0.96180556 0.9501634  0.91707516
 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503
```

```
  0.91115196 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268
  0.81372549 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203
  0.79513889 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255
  0.78656046 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569
  0.76776961 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529
  0.81147876 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569
  0.72283497 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092
  0.77328431 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902
  0.7879902  0.79473039 0.81168301 0.81699346 0.82986111 0.83843954
  0.83884804 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085
  0.88480392 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322
  0.55198026 0.49116346 0.46929827 0.45402214]
Day 6 output [[0.43889728]]
Day 7 input [0.85743464 0.89746732 0.89828431 0.89542484 0.90604575 0.91911765
 0.91748366 0.92177288 0.96180556 0.94750817 0.94035948 0.94056373
 0.94485294 0.94771242 0.96670752 0.95731209 0.95241013 0.94914216
 1.         0.98876634 0.96180556 0.9501634  0.91707516 0.92892157
 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196
 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549
 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889
 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046
 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961
 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876
 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497
 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431
 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902
 0.79473039 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804
 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392
 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322 0.55198026
 0.49116346 0.46929827 0.45402214 0.43889728]
Day 7 output [[0.4289838]]
Day 8 input [0.89746732 0.89828431 0.89542484 0.90604575 0.91911765 0.91748366
 0.92177288 0.96180556 0.94750817 0.94035948 0.94056373 0.94485294
 0.94771242 0.96670752 0.95731209 0.95241013 0.94914216 1.
 0.98876634 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405
 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765
 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098
 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889
 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791
 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196
 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699
 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033]
```

```
  0.74693627 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797
  0.78329248 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039
  0.81168301 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863
  0.82598039 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608
  0.84027778 0.84497549 0.79536206 0.67249322 0.55198026 0.49116346
  0.46929827 0.45402214 0.43889728 0.42898381]
Day 8 output [[0.42534664]]
Day 9 input [0.89828431 0.89542484 0.90604575 0.91911765 0.91748366 0.92177288
  0.96180556 0.94750817 0.94035948 0.94056373 0.94485294 0.94771242
  0.96670752 0.95731209 0.95241013 0.94914216 1.         0.98876634
  0.96180556 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386
  0.9121732  0.9121732  0.90216503 0.91115196 0.85661765 0.84722222
  0.79207516 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405
  0.83394608 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556
  0.75837418 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039
  0.79207516 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288
  0.79697712 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438
  0.73978758 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627
  0.72630719 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248
  0.80412582 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301
  0.81699346 0.82986111 0.83843954 0.83884804 0.82781863 0.82598039
  0.85028595 0.85886438 0.86254085 0.88480392 0.86519608 0.84027778
  0.84497549 0.79536206 0.67249322 0.55198026 0.49116346 0.46929827
  0.45402214 0.43889728 0.42898381 0.42534664]
Day 9 output [[0.42578852]]
Day 10 input [0.89542484 0.90604575 0.91911765 0.91748366 0.92177288 0.96180556
  0.94750817 0.94035948 0.94056373 0.94485294 0.94771242 0.96670752
  0.95731209 0.95241013 0.94914216 1.         0.98876634 0.96180556
  0.9501634  0.91707516 0.92892157 0.93096405 0.92422386 0.9121732
  0.9121732  0.90216503 0.91115196 0.85661765 0.84722222 0.79207516
  0.78492647 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608
  0.82107843 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418
  0.74019608 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516
  0.79534314 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712
  0.8057598  0.80698529 0.81147876 0.78206699 0.73386438 0.73978758
  0.74448529 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719
  0.80065359 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582
  0.79473039 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346
  0.82986111 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595
  0.85886438 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549
  0.79536206 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214
  0.43889728 0.42898381 0.42534664 0.42578852]
```

```
Day 10 output [[0.4284406]]
Day 11 input [0.90604575 0.91911765 0.91748366 0.92177288 0.96180556 0.94750817
 0.94035948 0.94056373 0.94485294 0.94771242 0.96670752 0.95731209
 0.95241013 0.94914216 1.         0.98876634 0.96180556 0.9501634
 0.91707516 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732
 0.90216503 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647
 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843
 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608
 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314
 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598
 0.80698529 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529
 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359
 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039
 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346 0.82986111
 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438
 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206
 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214 0.43889728
 0.42898381 0.42534664 0.42578852 0.4284406 ]
Day 11 output [[0.43218586]]
Day 12 input [0.91911765 0.91748366 0.92177288 0.96180556 0.94750817 0.94035948
 0.94056373 0.94485294 0.94771242 0.96670752 0.95731209 0.95241013
 0.94914216 1.         0.98876634 0.96180556 0.9501634  0.91707516
 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503
 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268
 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203
 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255
 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569
 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529
 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569
 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092
 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902
 0.7879902  0.79473039 0.81168301 0.81699346 0.82986111 0.83843954
 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085
 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322
 0.55198026 0.49116346 0.46929827 0.45402214 0.43889728 0.42898381
 0.42534664 0.42578852 0.4284406  0.43218586]
Day 12 output [[0.43614265]]
Day 13 input [0.91748366 0.92177288 0.96180556 0.94750817 0.94035948 0.94056373
 0.94485294 0.94771242 0.96670752 0.95731209 0.95241013 0.94914216
 1.         0.98876634 0.96180556 0.9501634  0.91707516 0.92892157
 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196
 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549
```

```
 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889
 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046
 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961
 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876
 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497
 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431
 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902
 0.79473039 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804
 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392
 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322 0.55198026
 0.49116346 0.46929827 0.45402214 0.43889728 0.42898381 0.42534664
 0.42578852 0.4284406  0.43218586 0.43614265]
Day 13 output [[0.4395612]]
Day 14 input [0.92177288 0.96180556 0.94750817 0.94035948 0.94056373 0.94485294
 0.94771242 0.96670752 0.95731209 0.95241013 0.94914216 1.
 0.98876634 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405
 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765
 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098
 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889
 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791
 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196
 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699
 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033
 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797
 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039
 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863
 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608
 0.84027778 0.84497549 0.79536206 0.67249322 0.55198026 0.49116346
 0.46929827 0.45402214 0.43889728 0.42898381 0.42534664 0.42578852
 0.4284406  0.43218586 0.43614265 0.43956119]
Day 14 output [[0.44189227]]
Day 15 input [0.96180556 0.94750817 0.94035948 0.94056373 0.94485294 0.94771242
 0.96670752 0.95731209 0.95241013 0.94914216 1.         0.98876634
 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386
 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765 0.84722222
 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405
 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556
 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039
 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288
 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438
 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627
 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248
```

```
 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301
 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863 0.82598039
 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608 0.84027778
 0.84497549 0.79536206 0.67249322 0.55198026 0.49116346 0.46929827
 0.45402214 0.43889728 0.42898381 0.42534664 0.42578852 0.4284406
 0.43218586 0.43614265 0.43956119 0.44189227]
Day 15 output [[0.44279933]]
Day 16 input [0.94750817 0.94035948 0.94056373 0.94485294 0.94771242 0.96670752
 0.95731209 0.95241013 0.94914216 1.         0.98876634 0.96180556
 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386 0.9121732
 0.9121732  0.90216503 0.91115196 0.85661765 0.84722222 0.79207516
 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608
 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418
 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516
 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712
 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438 0.73978758
 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719
 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582
 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346
 0.82986111 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595
 0.85886438 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549
 0.79536206 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214
 0.43889728 0.42898381 0.42534664 0.42578852 0.4284406  0.43218586
 0.43614265 0.43956119 0.44189227 0.44279933]
Day 16 output [[0.44213253]]
Day 17 input [0.94035948 0.94056373 0.94485294 0.94771242 0.96670752 0.95731209
 0.95241013 0.94914216 1.         0.98876634 0.96180556 0.9501634
 0.91707516 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732
 0.90216503 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647
 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843
 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608
 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314
 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598
 0.80698529 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529
 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359
 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039
 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346 0.82986111
 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438
 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206
 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214 0.43889728
 0.42898381 0.42534664 0.42578852 0.4284406  0.43218586 0.43614265
 0.43956119 0.44189227 0.44279933 0.44213253]
```

```
Day 17 output [[0.43990052]]
Day 18 input [0.94056373 0.94485294 0.94771242 0.96670752 0.95731209 0.95241013
 0.94914216 1.         0.98876634 0.96180556 0.9501634  0.91707516
 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503
 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268
 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203
 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255
 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569
 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529
 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569
 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092
 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902
 0.7879902  0.79473039 0.81168301 0.81699346 0.82986111 0.83843954
 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085
 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322
 0.55198026 0.49116346 0.46929827 0.45402214 0.43889728 0.42898381
 0.42534664 0.42578852 0.4284406  0.43218586 0.43614265 0.43956119
 0.44189227 0.44279933 0.44213253 0.43990052]
Day 18 output [[0.4362419]]
Day 19 input [0.94485294 0.94771242 0.96670752 0.95731209 0.95241013 0.94914216
 1.         0.98876634 0.96180556 0.9501634  0.91707516 0.92892157
 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196
 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549
 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889
 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046
 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961
 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876
 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497
 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431
 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902
 0.79473039 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804
 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392
 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322 0.55198026
 0.49116346 0.46929827 0.45402214 0.43889728 0.42898381 0.42534664
 0.42578852 0.4284406  0.43218586 0.43614265 0.43956119 0.44189227
 0.44279933 0.44213253 0.43990052 0.43624189]
Day 19 output [[0.4313935]]
Day 20 input [0.94771242 0.96670752 0.95731209 0.95241013 0.94914216 1.
 0.98876634 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405
 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765
 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098
 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889
```

```
   0.74305556 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791
   0.79473039 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196
   0.76552288 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699
   0.73386438 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033
   0.74693627 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797
   0.78329248 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039
   0.81168301 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863
   0.82598039 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608
   0.84027778 0.84497549 0.79536206 0.67249322 0.55198026 0.49116346
   0.46929827 0.45402214 0.43889728 0.42898381 0.42534664 0.42578852
   0.4284406  0.43218586 0.43614265 0.43956119 0.44189227 0.44279933
   0.44213253 0.43990052 0.43624189 0.4313935 ]
Day 20 output [[0.42565528]]
Day 21 input [0.96670752 0.95731209 0.95241013 0.94914216 1.         0.98876634
 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386
 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765 0.84722222
 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405
 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556
 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039
 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288
 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438
 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627
 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248
 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301
 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863 0.82598039
 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608 0.84027778
 0.84497549 0.79536206 0.67249322 0.55198026 0.49116346 0.46929827
 0.45402214 0.43889728 0.42898381 0.42534664 0.42578852 0.4284406
 0.43218586 0.43614265 0.43956119 0.44189227 0.44279933 0.44213253
 0.43990052 0.43624189 0.4313935  0.42565528]
Day 21 output [[0.41935417]]
Day 22 input [0.95731209 0.95241013 0.94914216 1.         0.98876634 0.96180556
 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386 0.9121732
 0.9121732  0.90216503 0.91115196 0.85661765 0.84722222 0.79207516
 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608
 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418
 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516
 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712
 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438 0.73978758
 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719
 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582
 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346
```

```
  0.82986111 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595
  0.85886438 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549
  0.79536206 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214
  0.43889728 0.42898381 0.42534664 0.42578852 0.4284406  0.43218586
  0.43614265 0.43956119 0.44189227 0.44279933 0.44213253 0.43990052
  0.43624189 0.4313935  0.42565528 0.41935417]
Day 22 output [[0.41280964]]
Day 23 input [0.95241013 0.94914216 1.         0.98876634 0.96180556 0.9501634
 0.91707516 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732
 0.90216503 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647
 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843
 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608
 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314
 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598
 0.80698529 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529
 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359
 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039
 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346 0.82986111
 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438
 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206
 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214 0.43889728
 0.42898381 0.42534664 0.42578852 0.4284406  0.43218586 0.43614265
 0.43956119 0.44189227 0.44279933 0.44213253 0.43990052 0.43624189
 0.4313935  0.42565528 0.41935417 0.41280964]
Day 23 output [[0.40630594]]
Day 24 input [0.94914216 1.         0.98876634 0.96180556 0.9501634  0.91707516
 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503
 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268
 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203
 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255
 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569
 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529
 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569
 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092
 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902
 0.7879902  0.79473039 0.81168301 0.81699346 0.82986111 0.83843954
 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085
 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322
 0.55198026 0.49116346 0.46929827 0.45402214 0.43889728 0.42898381
 0.42534664 0.42578852 0.4284406  0.43218586 0.43614265 0.43956119
 0.44189227 0.44279933 0.44213253 0.43990052 0.43624189 0.4313935
 0.42565528 0.41935417 0.41280964 0.40630594]
```

```
Day 24 output [[0.4000724]]
Day 25 input [1.         0.98876634 0.96180556 0.9501634  0.91707516 0.92892157
 0.93096405 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196
 0.85661765 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549
 0.81495098 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889
 0.76388889 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046
 0.79268791 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961
 0.78615196 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876
 0.78206699 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497
 0.74040033 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431
 0.78451797 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902
 0.79473039 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804
 0.82781863 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392
 0.86519608 0.84027778 0.84497549 0.79536206 0.67249322 0.55198026
 0.49116346 0.46929827 0.45402214 0.43889728 0.42898381 0.42534664
 0.42578852 0.4284406  0.43218586 0.43614265 0.43956119 0.44189227
 0.44279933 0.44213253 0.43990052 0.43624189 0.4313935  0.42565528
 0.41935417 0.41280964 0.40630594 0.4000724 ]
Day 25 output [[0.39427316]]
Day 26 input [0.98876634 0.96180556 0.9501634  0.91707516 0.92892157 0.93096405
 0.92422386 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765
 0.84722222 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098
 0.80596405 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889
 0.74305556 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791
 0.79473039 0.79207516 0.79534314 0.78921569 0.76776961 0.78615196
 0.76552288 0.79697712 0.8057598  0.80698529 0.81147876 0.78206699
 0.73386438 0.73978758 0.74448529 0.72671569 0.72283497 0.74040033
 0.74693627 0.72630719 0.80065359 0.79187092 0.77328431 0.78451797
 0.78329248 0.80412582 0.79473039 0.7879902  0.7879902  0.79473039
 0.81168301 0.81699346 0.82986111 0.83843954 0.83884804 0.82781863
 0.82598039 0.85028595 0.85886438 0.86254085 0.88480392 0.86519608
 0.84027778 0.84497549 0.79536206 0.67249322 0.55198026 0.49116346
 0.46929827 0.45402214 0.43889728 0.42898381 0.42534664 0.42578852
 0.4284406  0.43218586 0.43614265 0.43956119 0.44189227 0.44279933
 0.44213253 0.43990052 0.43624189 0.4313935  0.42565528 0.41935417
 0.41280964 0.40630594 0.4000724  0.39427316]
Day 26 output [[0.38900536]]
Day 27 input [0.96180556 0.9501634  0.91707516 0.92892157 0.93096405 0.92422386
 0.9121732  0.9121732  0.90216503 0.91115196 0.85661765 0.84722222
 0.79207516 0.78492647 0.75878268 0.81372549 0.81495098 0.80596405
 0.83394608 0.82107843 0.80923203 0.79513889 0.76388889 0.74305556
 0.75837418 0.74019608 0.77512255 0.78656046 0.79268791 0.79473039
```

```
  0.79207516 0.79534314 0.78921569 0.76776961 0.78615196 0.76552288
  0.79697712 0.8057598  0.80698529 0.81147876 0.78206699 0.73386438
  0.73978758 0.74448529 0.72671569 0.72283497 0.74040033 0.74693627
  0.72630719 0.80065359 0.79187092 0.77328431 0.78451797 0.78329248
  0.80412582 0.79473039 0.7879902  0.7879902  0.79473039 0.81168301
  0.81699346 0.82986111 0.83843954 0.83884804 0.82781863 0.82598039
  0.85028595 0.85886438 0.86254085 0.88480392 0.86519608 0.84027778
  0.84497549 0.79536206 0.67249322 0.55198026 0.49116346 0.46929827
  0.45402214 0.43889728 0.42898381 0.42534664 0.42578852 0.4284406
  0.43218586 0.43614265 0.43956119 0.44189227 0.44279933 0.44213253
  0.43990052 0.43624189 0.4313935  0.42565528 0.41935417 0.41280964
  0.40630594 0.4000724  0.39427316 0.38900536]
Day 27 output [[0.3843052]]
Day 28 input [0.9501634  0.91707516 0.92892157 0.93096405 0.92422386 0.9121732
  0.9121732  0.90216503 0.91115196 0.85661765 0.84722222 0.79207516
  0.78492647 0.75878268 0.81372549 0.81495098 0.80596405 0.83394608
  0.82107843 0.80923203 0.79513889 0.76388889 0.74305556 0.75837418
  0.74019608 0.77512255 0.78656046 0.79268791 0.79473039 0.79207516
  0.79534314 0.78921569 0.76776961 0.78615196 0.76552288 0.79697712
  0.8057598  0.80698529 0.81147876 0.78206699 0.73386438 0.73978758
  0.74448529 0.72671569 0.72283497 0.74040033 0.74693627 0.72630719
  0.80065359 0.79187092 0.77328431 0.78451797 0.78329248 0.80412582
  0.79473039 0.7879902  0.7879902  0.79473039 0.81168301 0.81699346
  0.82986111 0.83843954 0.83884804 0.82781863 0.82598039 0.85028595
  0.85886438 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549
  0.79536206 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214
  0.43889728 0.42898381 0.42534664 0.42578852 0.4284406  0.43218586
  0.43614265 0.43956119 0.44189227 0.44279933 0.44213253 0.43990052
  0.43624189 0.4313935  0.42565528 0.41935417 0.41280964 0.40630594
  0.4000724  0.39427316 0.38900536 0.38430521]
Day 28 output [[0.38015825]]
Day 29 input [0.91707516 0.92892157 0.93096405 0.92422386 0.9121732  0.9121732
  0.90216503 0.91115196 0.85661765 0.84722222 0.79207516 0.78492647
  0.75878268 0.81372549 0.81495098 0.80596405 0.83394608 0.82107843
  0.80923203 0.79513889 0.76388889 0.74305556 0.75837418 0.74019608
  0.77512255 0.78656046 0.79268791 0.79473039 0.79207516 0.79534314
  0.78921569 0.76776961 0.78615196 0.76552288 0.79697712 0.8057598
  0.80698529 0.81147876 0.78206699 0.73386438 0.73978758 0.74448529
  0.72671569 0.72283497 0.74040033 0.74693627 0.72630719 0.80065359
  0.79187092 0.77328431 0.78451797 0.78329248 0.80412582 0.79473039
  0.7879902  0.7879902  0.79473039 0.81168301 0.81699346 0.82986111
  0.83843954 0.83884804 0.82781863 0.82598039 0.85028595 0.85886438
```

```
 0.86254085 0.88480392 0.86519608 0.84027778 0.84497549 0.79536206
 0.67249322 0.55198026 0.49116346 0.46929827 0.45402214 0.43889728
 0.42898381 0.42534664 0.42578852 0.4284406  0.43218586 0.43614265
 0.43956119 0.44189227 0.44279933 0.44213253 0.43990052 0.43624189
 0.4313935  0.42565528 0.41935417 0.41280964 0.40630594 0.4000724
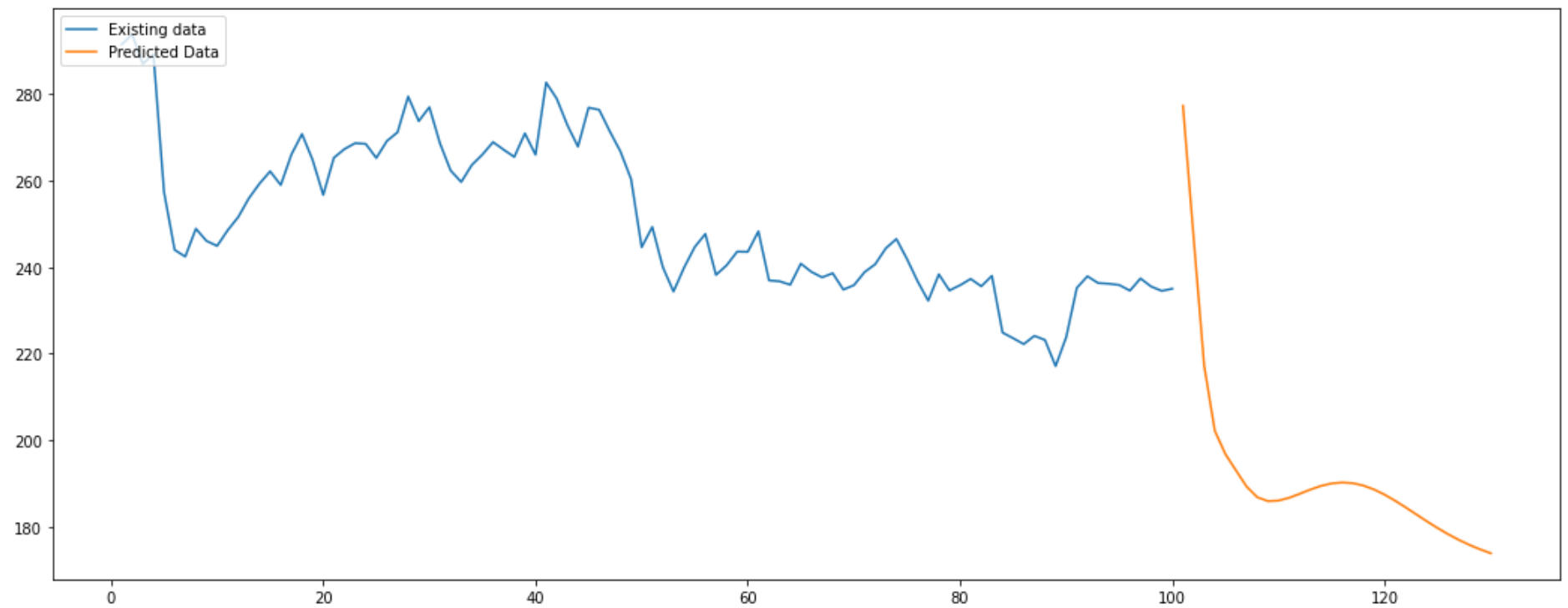 0.39427316 0.38900536 0.38430521 0.38015825]
Day 29 output [[0.37651244]]
[[0.7953620553016663], [0.6724932193756104], [0.5519802570343018], [0.4911634624004364], [0.46929827332496643], [0.4540221393
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096401691437], [0.4063059389591217], [0.4000723958015442], [0.39427316188812256], [0.3890053629875183], [0.3843052089214325],
[0.3801582455635071], [0.37651243805885315]]
```

predicting future stock

In [80]:
```python
new_day = np.arange(1, 101)
pred_day = np.arange(101, 131)
```

In [81]:
```python
plt.figure(figsize=(18, 7))
plt.plot(new_day, sc.inverse_transform(df[1935:]), label="Existing data")
plt.plot(pred_day, sc.inverse_transform(output), label="Predicted Data")
plt.legend(loc="upper left")
plt.show()
```

Thank you

In [ ]: